REMARKS

This application has been carefully reviewed in light of the Examiner's Action dated December 22, 2008. Each of the pending independent claims has been amended for clarity. Reconsideration and full allowance are respectfully requested.

§ 101 Rejection

Claims 1-26 and 59-61 were rejected under 35 USC § 101 as being directed to non-statutory subject matter. In particular, the Examiner asserts that the pending claims are drawn to an abstract idea that is not sufficiently tied to a particular application. This rejection is respectfully traversed for the reasons set forth in detail below.

As presented, Independent Claim 1 is directed to a medical signal processing method that involves receiving a medical diagnostic signal and processing the signal to provide diagnostic information concerning tissue or fluid of the patient. More specifically, the method involves receiving, at a processor of a medical device, information corresponding to a defined time interval of the medical diagnostic signal. In this regard, the medical diagnostic signal has been modulated based on interaction with tissue or fluid of a patient. The processor is then used to perform a transform on the time-based information to provide a frequency spectrum defined by irregularly spaced non-zero amplitude values that are calculate directly from the transform. This transform further involves representing the time-based medical diagnostic signal as a series of piecewise function segments. The processor is then operated to provide an output including diagnostic information concerning the tissue or fluid of the patient based on the medical diagnostic signal. Generally corresponding apparatus limitations are set forth in Independent Claim 59.

As discussed at length in the specification, this process allows the invention to address a number of limitations of conventional signal processing in medical contexts. For example, conventionally, in the context of processing time-based ultrasound signals, the received ultrasound signal is typically sampled to yield a series of amplitude values. This time series of values is then typically processed using a Discrete Fourier Transform, such as a Fast Fourier Transform process, that involves determining frequency components of the signal at regularly spaced frequencies that are integer multiples of a fundamental frequency. While the resulting spectrum may be depicted as

being continuous, it is based on calculated values that are determined with respect to discrete and regularly spaced frequencies.

As discussed in the specification, one shortcoming of such transforms is that such methods produce spectral estimates for only a small number of discrete frequencies, and significant errors may be produced. In addition, such transforms may be problematic where the signal is not stationary and it is desired to obtain information corresponding to a short time interval of measurements. Thus, for example, conventional methods such as Fast Fourier Transforms are problematic for obtaining accurate velocity profile information based on Doppler ultrasound information with respect to a pulsing blood vessel where such profiles are rapidly changing. The present invention addresses such issues by enabling calculations of values other than at discrete frequencies corresponding to an integer multiple of a fundamental frequency used for measurement and allowing calculations based on short time intervals of the signal of interest.

Applicant therefore respectfully submits that the claims are not directed to an abstract idea and, in any event, any abstract ideas implicated within the subject matter of the present claims are tied to a practical application so as to yield statutory subject matter. Initially, Applicant notes that, as presented, the claim is not directed to abstract mathematical processes but, rather, each step is related to operating a processor of a medical device with regard to a specific medical diagnostic signal processing application. Accordingly, Applicant respectfully submits that the claims are not directed to abstract ideas, and the Examiner's analysis regarding application of such ideas is unwarranted.

In any event, Applicant respectfully submits that any requirement of a practical application is satisfied by the claimed subject matter. The Examiner indicates that, "it can be argued that the claim does not provide a useful result in that the claim does not actually solve a problem." It is not clear whether the Examiner is or is not arguing that usefulness has not been established in this case. Applicant does not concede in this regard that the test of solving a problem is an appropriate test for usefulness under 35 USC § 101. In any event, Applicant respectfully submits that Claim 1 specifically recites a problem solution by way of performing a transform that involves representing the time-based medical diagnostic signal as a series of piecewise function segments and obtaining a frequency spectrum defined by an irregularly spaced series of nonzero amplitude values. Moreover, this transform is used to provide an output including diagnostic information concerning the tissue or

fluid of the patient. Accordingly, Applicant respectfully submits that the Examiner's concern in this regard has been obviated.

The Examiner further asserts that the claim is subject to a tangible result requirement under 35 USC § 101 that is not satisfied. In this regard, the Examiner asserts that the subject matter is not applied to produce a real world result. As noted above, the claim specifically recites that the processor of the medical device provides an output including diagnostic information concerning tissue or fluid of the patient. Applicant respectfully submits that this is a real world result. Indeed, Applicant respectfully submits that providing diagnostic information is the basic objective of many patented medical devices.

The Examiner further asserts that the claimed subject matter is subject to a concrete result requirement under 35 USC § 101 and that this test is not satisfied because the claim does not provide a result that can be assured and that the result can be substantially repeatable. The basis for this assertion by the Examiner is simply not understood. The Examiner provides no reasoning to indicate why the result of the present invention would not be repeatable. In this regard, if the Examiner persists in asserting that the results are not repeatable, Applicant respectfully requests that the Examiner explain in detail the basis for this assertion so that Applicant can establish a proper record for appeal.

Applicant therefore respectfully submits that Independent Claims 1 and 59, and their respective dependent claims, include statutory subject matter under 35 USC § 101 and this rejection should be withdrawn.

§ 102 Rejection

Initially, Applicant would like to thank the Examiner for his indication that Claims 12-26 include allowable subject matter. These claims have not been rewritten in independent form as it is believed that Independent Claim 1 is allowable as presented for the reasons set forth in more detail below.

Claims 1-5, 7-9, 11 and 59-61 were rejected under 35 USC § 102(b) as being anticipated by Scheib et al, U.S. Patent No. 5,628,321 ("Scheib"). This rejection is respectfully traversed for reasons set forth in detail below.

As discussed above, Claim 1 is directed to a method for processing medical signals that involves receiving a time-based, medical diagnostic signal, performing a transform on the time-based signal to obtain a frequency spectrum defined by a set of irregularly spaced nonzero amplitude values calculated directly from the transform, and operating a processor to provide an output including diagnostic information concerning blood or tissue of a patient based on a medical diagnostic signal. The step of performing a transform involves representing the time-based, medical diagnostic signal as a piecewise series of function segments. As discussed above, this methodology allows for, among other things, accurate transforms of signals of varying frequency composition based on a short signal sampling interval. Generally corresponding apparatus limitations are set forth in Independent Claim 59.

Scheib is directed to an ultrasound system for determining an optimal cardiac cycle of a patient and performing vascular measurements. Among other things, the Examiner cites certain figures of Scheib as disclosing a spectrum that appears continuous in its graphical representation. However, Scheib specifically discloses that the ultrasound signal is processed using a Fast Fourier Transform. As is well-known, a Fast Fourier Transform is a species of Discrete Fourier Transform that involves sampling the signal at discrete frequencies that are integer multiples of a fundamental frequency used for the measurement. Accordingly, regardless of the graphical representation of the spectrum, the spectrum is not defined by a transform where the calculated points of the transform are at regularly spaced frequencies. In any event, Scheib does not disclose the claimed subject matter related to representing the time-based, medical diagnostic signal as a piecewise series of function segments as claimed. Applicant therefore respectfully submits that this rejection should be withdrawn with respect to Independent Claims 1 and 59 and their respective dependent claims.

§ 103 Rejection

Claims 6 and 10 were rejected under 35 USC § 103(a) as being unpatentable over Scheib in view of an article by Jean-Yves ("Jean-Yves"). Applicant respectfully submits that these claims are allowable as depending from an allowable base claim for the reasons set forth above. In addition, as discussed above, Scheib discloses a system where signals are processed using Fast Fourier Transform algorithm and does not disclose a transform for yielding a spectrum defined by irregularly spaced nonzero values calculated directly from the transform, much less such a transform that

involves representing the medical diagnostic signal as a piecewise series of function segments. The section of Jean-Yves cited by the Examiner relates to a comparison of conventional Fast Fourier Transform and Auto-Regressive analyses. These conventional techniques are described in detail in the Background section of the present application. Neither of these methods involves performing a transform to obtain a spectrum defined by irregularly spaced nonzero values where the transform further involves representing the time-based, medical diagnostic signal by a piecewise series of function segments. Accordingly, Applicant respectfully submits that the proposed combination of Scheib and Jean-Yves, even assuming arguendo that such combination is proper, does not yield the claimed subject matter.

Based upon the foregoing, Applicants believe that all pending claims are in condition for allowance and such disposition is respectfully requested. In the event that a telephone conversation would further prosecution and/or expedite allowance, the Examiner is invited to contact the undersigned.

Respectfully submitted,

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